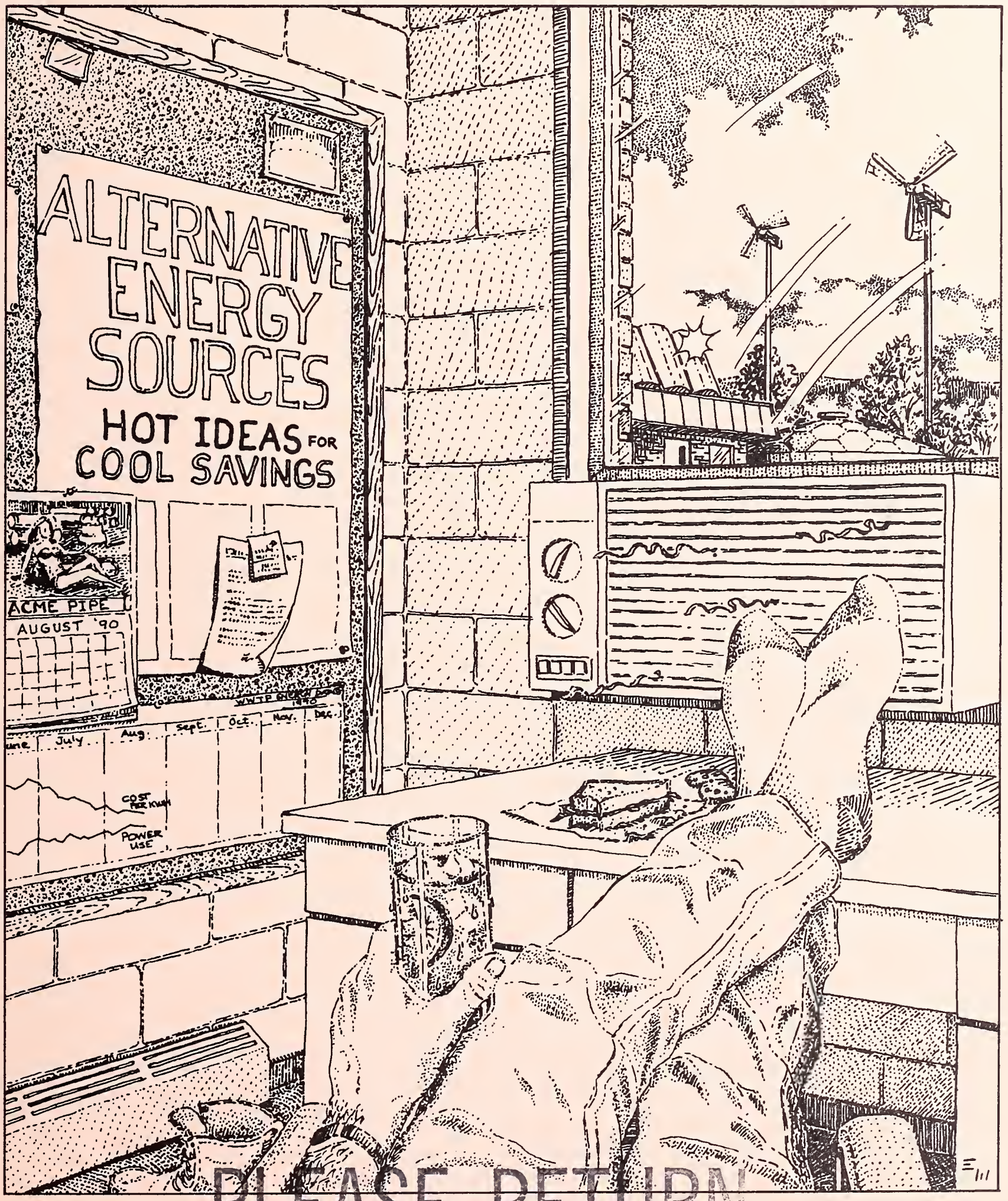
Big Sky Clearwater

FALL 1990



If you have any ideas or information that you would like to pass along to other people involved in the water and wastewater field, please don't hesitate to contact the office of the Water Quality Bureau. This publication welcomes articles of interest and random pieces of information regarding anything to do with water.

An article may consist of your own thoughts and ideas about something you may have experienced. Perhaps such information could help someone else in their day-to-day work. It could also be a technical article that is developed from research information and library resource material. If it has to do with water and you think it may be of interest, give us a call at the WQB: 444-2406.

If you do not wish to continue receiving this publication please send us your name and address so that we can remove your name from our mailing list.

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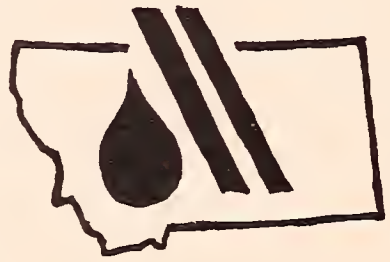

The Big Sky Clearwater is for water and wastewater operators across Montana. It is published two times a year by the Water Quality Bureau of the State Department of Health and Environmental Sciences in cooperation with the Montana Section of the American Water Works Association and the Montana Water Pollution Control Association.

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ALTERNATIVE ENERGY SOURCES FOR WASTEWATER TREATMENT PLANTS

By: Scott Anderson
Water Quality Bureau

Energy to power wastewater treatment facilities can often be one of the major single expenses a community must pay. The EPA Water Engineering Research Laboratory in Cincinnati has developed a technical assessment of alternative sources of power for wastewater treatment plants with recommendations on those sources which might be cost-effective in comparison to more conventional power supplies. The findings of the report are applicable to todays situation; as new technologies develop and costs for conventional energy sources increase other alternative power sources may become cost-effective for plant retrofits or new plant construction. While the report was written in reference to meeting the energy requirements of wastewater plants, many of these technologies could be applied to water treatment plants. Based on EPA's assessment, the following alternative energy technologies appear to be potentially cost-effective:

Heat Pumps

Heat pumps which extract heat from the waste stream are commercially available and can be used as an alternative source of space or process heating. Wastewater maintains a relatively constant temperature throughout the year (approximately 10-15^{o}C) supplying energy which the heat pump would utilize. This technology would be most usable in more complex mechanical plants with significant space heating needs.

Solar Heat

The report considered active, passive, and photovoltaic solar systems and concluded that, while the technology is commercially available for all three methods, the capital costs for active and photovoltaic systems are high and therefore not cost-effective. Passive solar systems for space heating were suggested as being worthwhile but dependent on the amount of available solar insulation and the costs of incorporating the systems into the architecture of the buildings to be heated. Montana does receive significant sunlight in the winter with passive solar systems now frequently utilized for residential space heating. It should be noted that significant research is underway for photovoltaic systems with more efficient and less expensive solar cells foreseeable in the future.

Geothermal Systems

Geothermal energy can be a viable alternative to conventional energy sources where supplies of sufficient flow and temperature are available. The Rocky Mountain states contain a number

of geothermal sites which may be suitable for this type of application.

Low-Head Hydro Systems

Low head hydro systems are commercially available and could be worthwhile in smaller wastewater treatment plants where the amount of energy generated represents a significant portion of overall system needs. The report suggests that these systems should be seriously considered where available head is greater than 10 feet.

Wind Power

Wind driven generators are commercially available and could be cost-effective for providing electrical energy to a treatment plant. The report suggests the systems should be considered where the plant energy load is greater than 1000 kWh/day and the wind flux is greater than 4000 kWh/yr-m^2. Montana was identified as an area that receives sufficient winds to meet this criteria.

The full report, entitled "Alternative Energy Sources for Wastewater Treatment Plants," (Order No. PB 88-239 090/AS: Cost $21.95) is available from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

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Mike Patterson, Butte Water Company Receives 1990 Fuller Award from Montana's Section of AWWA

The George Warren Fuller Award is conferred on one member in each of the sections of AWWA every year. It is awarded for distinguished service in the water supply field and in commemoration of the sound engineering skill, the brilliant diplomatic talent, and constructive leadership in the Association which characterized the life of George Warren Fuller.

Congratulations, Mike, you deserved it!!!

AWWA National President, Harry Snider, and Jerry Lukasik, MSAWWA President, awarded Mike Patterson the Fuller Award

REVIEW PROCEDURE AND BENEFITS OF PLANS AND SPECIFICATIONS

By: Tom Slovarp
Water Quality Bureau

Your plans and specifications for siting, new construction and modification of public water supply and wastewater systems must be reviewed and approved by the Department of Health and Environmental Sciences (DHES) prior to the beginning of construction. This is a requirement of the Administrative Rules of Montana (ARM 16.20.401). This probably triggers many questions you may have:

Just what is the purpose of this rule?
The purpose of this rule is to protect public health and the quality of state waters by assuring that water and sewer systems are constructed using accepted criteria (e.g., Ten States Standards), procedures and materials.

Does this rule apply to my system?
Yes, if it is a public system.

What is considered a public water or sewer system?
A public water or sewer system is a system which is designed to serve or serves ten or more families or 25 or more persons daily for a period of at least 60 days out of the calendar year.

What type of project needs to be reviewed and approved?
All new public water and sewer systems or modifications thereof must be approved. In general, changes in size, location, material, or additions require approval. Repairs do not need approval. Approval is needed prior to construction.

How does the review process usually work?
A professional engineer is hired by the community to prepare a design report, plans and specifications in accordance with state standards. The report and plans and specifications are submitted by the engineer to the DHES for review. Changes resulting from the review are then incorporated into the project by the engineer and resubmitted for final review and approval. DHES approval is issued in writing and the system owner has two years to construct the project or the approval is void. Within 90 days after construction is completed the owner must submit a professional engineer's certification that the construction was completed in accordance with the plans and specifications approved by the DHES. This certification must be accompanied by a complete set of "as built" drawings.

Besides protection of public health and state waters, are there any other benefits to the review process?
This question can best be answered by some examples of problems experienced by a few communities that failed to submit their project for review prior to construction.

A new sewage lagoon cell was excavated near an existing lagoon. The community found out later that the cell was located in the floodway of a local stream and therefore was unusable.

Sewer mains smaller than minimum and at slopes flatter than the minimum required slope, were constructed resulting in slow velocities, solids settling in the pipe and inadequate capacity to serve growth in the area.

Poorly designed additions to water systems have resulted in substandard pressure and inadequate fire-flows.

Water mains have been installed which are subject to freezing because they were not constructed deep enough.

Unsafe chlorination facilities have been constructed without proper separation and ventilation.

These are just a few examples of problems and unnecessary expenditures which could have been avoided if the proper review process had been employed before construction of the projects. In addition, review helps assure that up-to-date designs, materials, and testing requirements are utilized. Aside from being required by regulation, the benefits of review outweigh the cost and time of going through the review process.

MINI CIP AVAILABLE

by Robb McCracken
Montana Department of Commerce

Robb McCracken explains the Mini Capital Improvements Plan (Mini CIP)

In a past issue of the Clearwater, we told you about the Mini CIP (Capital Improvements Plan) education project. The Mini CIP is a recommended process to help small towns and county water/sewer districts to plan, prioritize and finance improvements to drinking water systems, sewage systems and street systems. The systematic process of preparing and carrying out a capital improvements plan has been used by larger local governments for over 50 years to help set priorities for ongoing public works repair needs and major construction improvements, as well as for financing the necessary improvements. Until now most small towns have not had a way to use the capital improvements planning process.

The Mini CIP project is designed to help small towns (those under 10,000 population). Essentially, a Mini CIP helps a small town assess facility needs and analyze the most cost-effective way to pay for the needed improvements.

Financial experts in Montana and at the national level state that a properly executed capital improvements plan can help a town to save money on repairs and improvements for their water system, sewage system and streets. If a local government adopts a Mini CIP, money can be saved using the following methods: the systematic approach to making improvements, the use of simple cost/benefit analysis to "stretch" revenues for ongoing repairs, use of depreciation factors in water/sewer user fees, and coordination of specific water, sewer and street projects. These and other methods are explained in the Mini CIP handbook.

The Mini CIP education project was funded by the Montana Community Development Block Grant Program, the Community Technical Assistance Program, and the MSU Rural Technical Assistance Program. The project was developed by a team of Montana financial specialists, Water Quality Bureau staff, engineers, public works experts, local government representatives, and water/sewer/street experts.

Limited numbers of free Mini CIP handbooks are available for small town representatives, water/sewer districts, public works directors, engineers, and financial consultants. Workshops on the Mini CIP are also planned. For example, a workshop was recently conducted as part of the AWWA Conference in Bozeman. **For further information on the Mini CIP, contact:** Robb McCracken or Ann Desch, Montana Department of Commerce, CTAP, Cogswell Building, Room C-211, Helena, Montana 59620, telephone 444-3757.

CLEAN OR DIRTY? BOTH!

By: Mark L. Richardson
City Manager, Miles City

In 1987, the citizens in Miles City voted to change the form of local government from a mayor/council form to a city manager/council form of government. With this change came a reorganization of the entire city structure. The City Council, in a drastic cost cutting measure, eliminated 12 positions and combined seven departments into five. In this reorganization the Water and Sanitary Sewer Departments were combined to form the Public Utilities Department. In January of 1988, I was promoted from Wastewater Treatment Plant Superintendent to Public Utilities Director.

With reduced staff to operate the Water and Wastewater Treatment Plants, I was faced with a difficult challenge. I wanted to maintain the high levels of service that I felt both the plants were providing, but the reorganization had resulted in the loss of two operators. The idea of cross-training all the operators in both water and wastewater treatment had always interested me and with the approval of the City Council, Water and Wastewater Treatment Plant Supervisor, Curt Myran and I began the process. Within 18 months all the operators were trained and cross-certified in both water and wastewater treatment. Curt was able to utilize all the operators at either plant, and this provided great flexibility in scheduling.

An interesting side benefit from the cross-training was noticed during the participation by the Water Treatment Plant in the Water Quality Bureau sponsored Composite Correction Program (CCP). The operators at the Water Treatment Plant, with their new experience in sludge handling and sampling gained from cross training at the Wastewater Treatment Plant, were better able to grasp the concepts used in controlling the sludge in the clarifiers at the Water Treatment Plant. When the personnel from Process Applications Inc., the contractor for the CCP, talked about centrifuge spin tests and core samples of sludge from the clarifier at the Water Treatment Plant it was old hat to the operators. They easily shifted some of their normal Wastewater Treatment Plant techniques in sludge monitoring and analysis to the Water Treatment Plant and were able to get control of the clarifies in short order.

The cross-training has helped in the operation of the Wastewater Treatment Plant also. The operators who had formerly worked at the Water Treatment Plant were used to monitoring their effluent by the use of turbidmeters. With their expertise, we now monitor our Wastewater Treatment Plant effluent for the normal parameters (BOD, TSS, etc.) but also turbidity. A change in the turbidity of the effluent is a quick indicator that modifications to the process may be in order.

I think that all the operators who have been cross-trained and certified as both water and wastewater treatment plant operators have a greater sense of professionalism and view themselves as more valuable employees. I wholeheartedly agree with them.

MWPCA Federation Director - Kristi Kline
Presents Art Riedinger with the 1990
Donald G. Willems Scholarship

The 1990 Donald G. Willems scholarship winner is Art Riedinger, a student at Northern Montana College. He is currently completing the two-year program in Water Quality and will be pursuing a Bachelor of Science degree in the environmental field with an emphasis on water quality. Art then hopes to continue his eduction in the environmental law area.

In addition to his curriculum studies, Art completed a cooperative education program with the Yellow Bay Wastewater Facility in the summer of 1989. He recently completed another cooperative education program studying biomonitoring using the Ceriodaphnia dubia organism.

Art stated, "This scholarship program is very much appreciated by the students. I would like to thank the associations for considering and selecting me as recipient of this award. I hope to be an asset to the water quality program and possibly make some type of meaningful contribution to Montana water quality."

SAVING ENERGY IN WASTEWATER TREATMENT SYSTEMS

by Chris Picotte

Energy Education Specialist

Montana Department of Natural Resources and Conservation

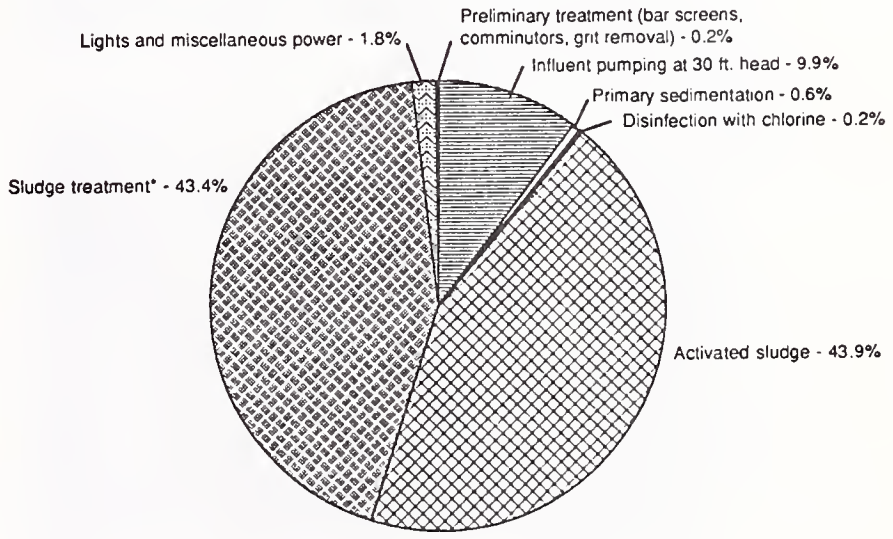
Energy use is one of the three major costs of wastewater treatment, accounting for over 25 percent of the operating costs of most plants.

Energy conservation translates directly into cost savings, dollars that can then be used on other ways. A Michigan study indicated that an average energy savings of 35 percent could be achieved at water and wastewater treatment plants. These energy saving measures paid for themselves in an average of 6.8 years.

Although each wastewater treatment plant uses energy in slightly different ways, some generalizations can be made. Pumping, for instance, is a major energy consumer at wastewater treatment plants, requiring 10 to 75 percent of the electrical energy purchased, not counting collection system pumping. Aeration usually comprises between 50 and 90 percent of the energy use in activated sludge plants. Sludge handling processes consume large amounts of energy, but use of biogas recovered from the anaerobic digestion of wastewater sludge can more than offset the energy lost. The following pie chart shows the electrical energy use of a typical activated sludge plant.

Electrical energy use in an activated sludge plant.

Adapted from WPCF (1982)



* If anaerobic digestion is employed, about one-half of the plant's electrical power requirements can be supplied by using digester gas to produce electricity.

The following steps are proven energy savers that can be used in any treatment system.

1. A continuing formalized commitment, at all levels of the organization, has proven to be the single most important element of a successful energy conservation effort. Commitment by management means providing operators with the leadership, encouragement and resources to enable them to reduce

energy consumption. Plant operators in return need to realize the importance of keeping management informed of their efforts and the results obtained.

2. Energy consumption should be tracked. If you compare the current month's energy consumption to last month's and to the same month for previous years, you can identify patterns and deviations that may alert you to problems. It will also help you track energy savings.

3. Do an energy audit on your wastewater plant. Workbooks are available to help you identify which energy saving measures will be easiest and lowest cost for your treatment system.

4. Implement the low-cost and no-cost measures identified in the energy audit. These measures generally involve operation and maintenance changes. Funds needed for implementation, if any, can come out of the plant expense budget since these measures usually pay for themselves in less than a year. Energy savings from these low-cost/no-cost measures usually represent about one-third of the possible energy savings in a plant.

5. Have an analysis done by a engineer experienced in wastewater energy conservation. This analysis will identify the more costly measures that could be implemented. Measures may include staged starting of motors, motor replacement, or matching motors more precisely to their load. Pump impellers may be replaced with smaller ones or machined down in some instances. Improved dewatering methods in the context of an optimum sludge management strategy may be implemented. Because of the cost, many of the measures recommended in an engineering analysis may require funding through separate line items. Such measures represent about two-thirds of the feasible energy savings in a plant. Measures that can be paid back in less than eight years through energy savings are generally considered to be economically advantageous. Studies have shown, however, that these measures will achieve their expected savings only if the operation and maintenance changes are continued.

6. Staff training is another important element, actually a vital part of the commitment to energy savings. A staff that doesn't know how to operate and maintain the equipment to its best advantage won't be able to help implement and maintain energy saving measures. Money, time, and energy will be wasted if training is ignored.

7. Consider energy use when buying new equipment or remodeling any buildings.

If you would like more information on energy conservation for wastewater treatment plants, the Department of Natural Resources and Conservation has some energy audit materials specifically aimed at wastewater treatment plants. Some materials will be given out while the supply lasts. Others can be lent out on a first come, first serve basis. You can call Chris Picotte at 444-6751. Also, Rita Docken of the Western Montana Local Government Energy Office (721-7294) has some relevant information and would be willing to help you research any specific questions.

MESSAGE FROM MWPCA

Barry Damschen, President

As incoming President of the Montana Water Pollution Control Association, I see exciting challenges ahead for our membership. During the early years of the Association, the majority of the emphasis was placed on the design and operation of sewage plants. In the past ten years, however, the Association has determined the need to focus on other issues as well as to protect the environment. These include proper disposal of hazardous waste, solid waste and ash from power plants to mention a few.

In recent years the Association has also determined the need to closely monitor state and federal regulations concerning programs aimed at protecting the surface and groundwater. For example the National Water Pollution Control Federation has spent considerable time evaluating the proposed sludge disposal regulations and providing the EPA with recommendations that will make the new regulations more practical, enforceable and economical to implement. Our state association along with the National Federation has also spent considerable time lobbying for grant and loan programs to fund badly needed wastewater collection and treatment facilities. Without such funding programs many communities will be financially handcuffed or simply unable to design and construct new facilities.

In recent years our state association as well as the National Federation, has greatly expanded it's membership of operators. The Montana Association is currently offering a one-half off membership fee for operators who join the Association this year. Members are entitled to receive several outstanding journals that cover the operation of wastewater systems and facilities. Members also are entitled to reduced registration fees at the annual state conference which will be held in Missoula this coming May . All operators are encouraged to take advantage of this one-half off membership fee offer.

In summary, I feel that being involved in the environmental pollution control field in the 1990's will be exciting and challenging, to say the least. More than ever before, it will be important for local officials, plant operators, designers and regulators to work together to design and operate water and wastewater treatment facilities that are technologically sound and easy and economical to operate. This is especially true here in Montana where our surface waters are pristine and funds are severely limited in most cases.

REGIONAL WPCF MEETING UPDATE

by:
Kristi Kline
Federation Director

The WPCF Northwest Frontier Region, which includes Montana, Washington, Oregon, Idaho, British Columbia and Alaska, held it's annual meeting in Vancouver, B.C. on June 9.

WPCF Executive Director, Quincalee Brown gave an update on the Federation's current activities. Dr. Brown discussed the development of the Research Foundation. Currently there are five assignments to be studied that will provide useful information to the municipal wastewater facilities, and provide direction for future research. These assignments include:

Transport and Fate of Toxins in Wastewater Facilities

VOC Vapor Phase Control Technology Assessment

Sludge Processing and Disposal-Innovative Process Assessment

Nonpoint Source Impact Assessment

Stuart Oppenheim, of the Pacific Northwest WPCA, presented a future regional membership outline that will include a member liaison to network our membership goals for our region and our own association.

Chuck Kaiser, President-Elect WPCF, presented the issue of a name change for WPCF. Recent information in the W & ET Journal and the Operations Forum explain that the federation is looking into the possibility of changing its name. They are asking the entire membership for input into suggestions for names or if you desire no changes. A Task Force committee has been formed to examine the responses from the membership and come up with some choices to present before the Executive Board at the meeting in October, at which time they will vote on this issue. I will be serving on that Task Force committee. If you have any questions or comments about the name change, give me a call at 265-9031.

The meeting concluded with all member associations sharing an exchange of ideas on what makes their association work, programs used, and new goals they have for this year.

Frederick S. Wendt
Wins the MWPCA Operator Award

Fred Wendt started working at the Butte Metro Wastewater Treatment Plant July 14, 1970.

Fred attended the Montana School of Mineral Science and Technology for three years (1967 - 1970), and has since earned an Associate of Arts degree and an Associate of Science and Engineering degree at Montana Tech.

Fred has exhibited outstanding dedication in order to acquire knowledge, understanding, and training on his job. His professional approach to his duties as well as his performance in the development of new ideas in plant operation, operator training and presentations on related subjects at Water Schools and Joint Annual MSAWWA/MWPCA Conferences have been outstanding achievements beyond his normal operating duties.

* *

KEEP THE LEAD OUT

By: Roy Wells, Water Quality Bureau

Did you know it is violation of federal law to use materials that are not "lead free" in plumbing connected to a public water supply? In 1986, the U.S. Congress responded to increased concerns of health authorities about lead poisoning. Its response is reflected in the 1986 Amendments to the Safe Drinking Water Act. Section 1417 of the 1986 amended act prohibits or bans the use of pipe, solder and flux that are not lead free.

The prohibition is limited to public water supply systems and potable water plumbing connected to a public water supply. Leaded joints for cast iron pipe repairs are excluded from the prohibition.

By definition "lead free" solder and flux have a maximum lead content of 0.2 percent. With respect to pipe and pipe fittings, "lead free" means a maximum lead content of 8.0 percent.

The federal law requires enforcement of the lead ban by the individual states through plumbing codes and other appropriate means. On December 31, 1987, the Administrative Rules of Montana concerning plumbing permits were revised to incorporate the lead ban.

This revision of the rules does not completely satisfy the intent of the federal law because the rules apply only to licensed plumbers. Montana law does not require licensing under a number of conditions. Two significant conditions are: single-family residence owners that do their own plumbing, and water utility employees or appointees installing service lines or water meters. Licensing is not required in either case.

If you are working on plumbing connected to public water supply that does not require a license, keep in mind failure to use lead free materials may not be a violation of current state laws and rules but it is a violation of federal law.

OUT OF SIGHT, OUT OF MIND

A Perspective on Water Quality

by

Jan Boyle, METC Coordinator

"Out of sight, out of mind." I'm reminded of this old cliche each time that I routinely turn on the water tap for a glass of water. Before my initiation into the water/wastewater treatment business as Montana Environmental Training Center (METC)Coordinator, water treatment was just a technical process that I was acquainted with from a biological standpoint. The association between it and the city water that I unconsciously drink when I'm in town was never really made. We all tend to turn that water tap on and expect "clean", unpolluted water to fill our glasses, giving no thought to the process it took to get there or to the people responsible, the operators. It's the old **"Out of sight, out of mind"** syndrome!

Another example is wastewater. How long have we used the medium of water to "wash" away that which we do not even want to talk about? Do many folks even know the process that is involved with treatment of that wastewater? Most likely not. It's an area of our lives that many choose to be ignorant of because of the very nature of the subject. The toilet is flushed, and that's that! The association between a good day of fly fishing on the clear Missouri River or any stream and flushing toilets is not even made. The water in which those "fish-story" brown trout live is, in fact, partly composed of a quality treated effluent from a wastewater treatment facility. The **"Out of sight, out of mind"** syndrome at work again!

It's really interesting to note that today there is an ever increasing concern and awareness about what is happening to our surface and groundwaters. Yet the connection between this trend and the water we drink and in which we take recreation doesn't seem to be made, at least not on the level that it should be. We continue to pollute the streams with sewage, industrial waste and hazardous materials and our groundwater with toxic chemicals and heavy metals. Yet our tap water is **assumed** to be safe to drink, potable every time. It's expected to be quality water.

I've learned through my own visits to several water and wastewater treatment facilities that the "quality" water we take for granted in the above situations is the result of a technology that incorporate <u>human</u> operations. The key word in water and wastewater treatment is **quality.** The processes involved to that end are aimed at producing a product that is both safe to drink (by all living things) and safe for receiving waters (in which other living things live). But without the expertise of knowledgeable operators in these fields, this would not be the case. Since many of the waters that the water and wastewater operators deal with are already polluted to various extents, any process to alleviate some of the pollution is certainly of great importance, especially when it involves our drinking water. Of course, treatment is not a panacea for our present water pollution problems. We must make every effort to consciously discontinue polluting our surface and groundwaters through sensitive awarenèss of our own habits that may be contributing to the problem and employing other more appropriate options that promote "healthy" water. These efforts are being made through various global and local environmental educational programs.

In the meantime, however, I'm glad to know <u>**now**</u> that <u>superior</u> treatment of our drinking water and wastewater is being done through the efforts of knowledgeable water and wastewater operators who work to see that their product is of a quality to promote a healthy environment for all living things. As the METC Coordinator, I see my job as an excellent opportunity to bring to these operators the best current available information pertaining to water and wastewater through workshops, seminars, and training sessions that will allow them to continue their work at a level of excellence. Continued growth in this direction can only contribute to a successful program in getting the word out to all about water and perhaps curing the **"Out of sight, out of mind"** syndrome.

For now, I applaud the efforts made by our "behind-the-scenes" water and wastewater operators in providing us with potable water.

Thanks guys and gals!

The Mechanics of a Trench Collapse

By
Jack L. Mickle, Ph.D.

Why do several hundred persons die each year in trenches? Why are several thousands injured or maimed? What is it that makes trenching so dangerous? Why, after decades of these accidents, is the situation unchanged?

Hundreds of thousands of trenches are opened every day in this country. Statistically, death and injury rates per hundred-thousand holes opened have improved over time. The lower numbers hold some encouragement, but they give little comfort to someone who has had a body broken by a cave-in, to someone who feels responsible for the death or injury of a fellow worker, or to those who have lost a friend or loved-one to a trench collapse.

We all know what trenches are and why the are created. And we know that trenches are normally a temporary excavation open for hours at the most. For economy of operation, contractors favor the minimum possible excavation per foot of pipe installed. Worker safety usually dictates more excavation or time to install protective devices. Production and safety goals would seem to be at odds. Yet it's been shown time and again that safety pays. Many would-be contractors, however, remain unconvinced.

Nature shows us that an open trench is an unnatural condition. Except for rock cliffs and river banks, the average landscape displays no vertical or near-vertical slopes. Rock cliffs, meanwhile, are slowly but surely weathering and falling; river banks frequently collapse.

The soil that snuffs out life in a trench collapse in not only suffocating; it is crushing, weighing easily 120 pounds per cubic foot. A cubic yard of soil would be as heavy as an automobile. In the cube of soil shown in figure 1, each one-foot-by-one-foot soil cube contributes 100 pounds to the column's total weight. The stress or load per unit area, is 100 pounds per square foot (psf). At a depth of two feet, a horizontal plane is carrying two cubic feet, or 200 psf. Using the same logic, at a depth of five feet, the vertical stress is 500 psf; and so on.

The stresses that accrue from this column of soil not only push down, they push out horizontally -- at a force approximately one-half as

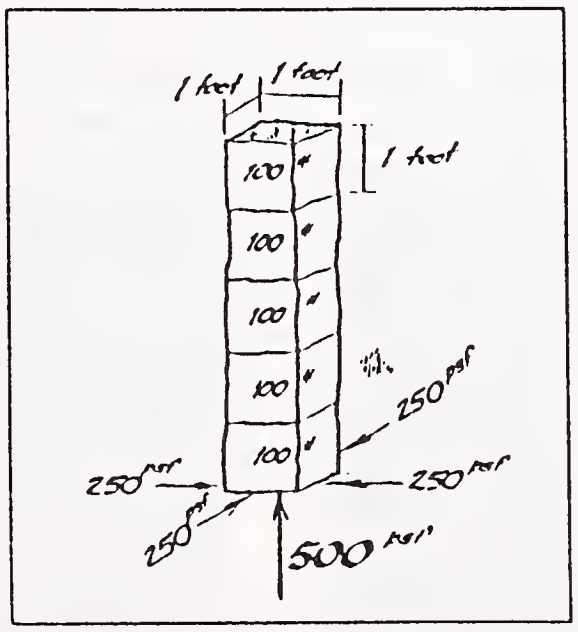


Figure 1

great as the vertical stresses. So, while this five-foot-tall soil column exerts a vertical (downward) stress at its base of 500 psf, it exerts a horizontal (or lateral) stress of 250 psf. Were this soil column not held in place by similar adjacent columns, it would soon collapse.

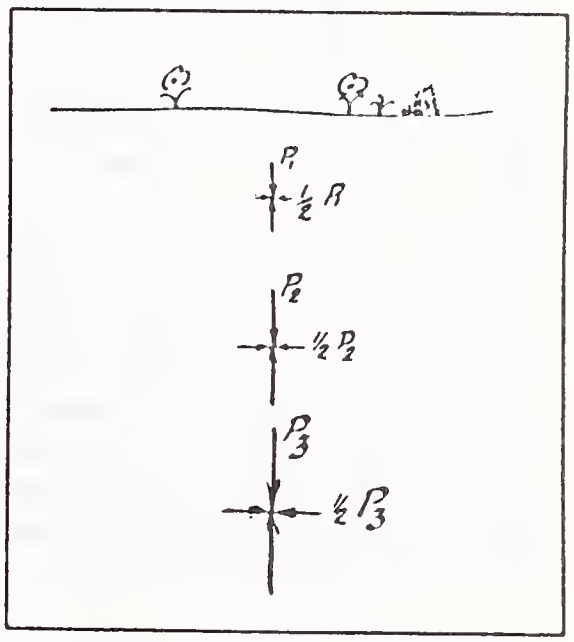


Figure 2

Figure 2 depicts an idealized "site" condition in an open, undisturbed field. Imagine an infinite number of columns of soil abutting each other. The vertical and horizontal stresses still exist and are of the same magnitude as shown on the individual soil column in figure 1. The system is in equilibrium and is perfectly stable.

When a trench is cut, the system shown in figure 2 is disturbed. As shown in figure 3, lateral stresses, which once pushed against the face of the trench wall (by the column of soil that was removed) no longer exist. The system is now unstable. The soil in the trench wall immediately begins to move into the trench. The movement may not be observable, but you can count on it. At the same time, the

surface of the ground next to the trench subsides. This creates an unnatural situation. The soil back from the edge of the trench holds onto the soil at the trench face, keeping it from caving into the trench. This creates a tensile stress at right angles to the trench wall. Soil, strong in compression, is weak in tension; as a result, tension cracks appear back from the edge of the trench and run parallel to the edge. Also, prior to cracking, part of the weight of the soil in the trench is carried by the soil back from the edge of the trench by shear. This can be visualized as a person carrying a large heavy package against their chest. It the package is gripped firmly enough, it is prevented, by shear, from sliding down the person's body. However, if the grip is loosened, the package will slide to the ground. The grip of the person carrying the package is much the same as the tension in the soil;

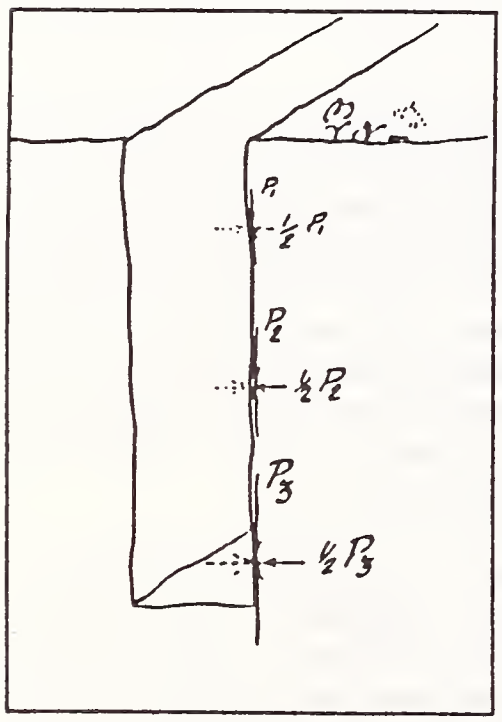


Figure 3

when the crack is opened, the soil tends to settle further, the same as the package sliding down the front of the person as the grip is released. The cracks occur at a distance equal to about one-third to two-thirds of the trench's dept (see figure 4).

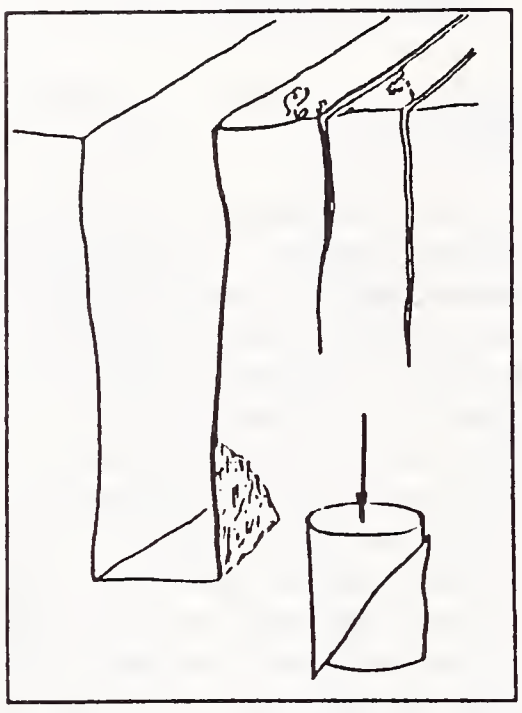


Figure 4

For example, if a ten-foot trench is dug, the cracks may be found somewhere from between three to seven feet back from the edge of the trench. There may be several cracks. The cracks are usually vertical and may be one-half as deep as the trench.

When these cracks develop, the weight of the soil in the trench wall is no longer carried in part by the soil back from the face of the wall (through shear). At this point, the soil in the trench wall looks very much like the column shown in figure 1. Next, the lower part of the trench wall fails under great stress from the weight of the soil above it (see figure 5).

When the bottom of the trench wall fails, or "kicks" into the trench, the support for the upper part of the trench wall is no longer effective. As shown in figure 5, the upper part of the trench will is now essentially hanging by shear and tensile forces. Failure occurs

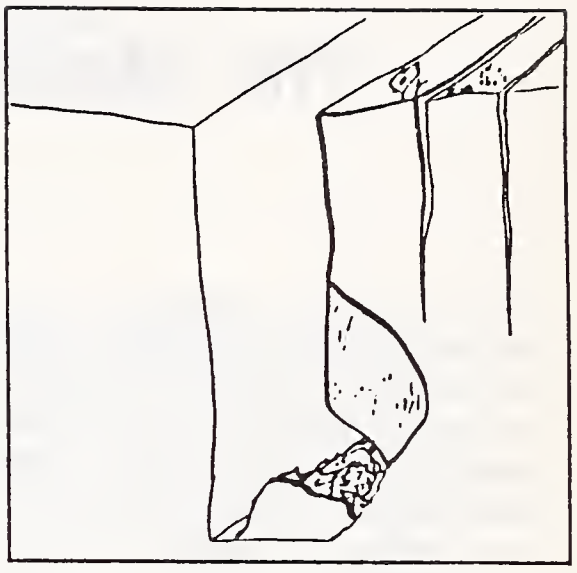


Figure 5

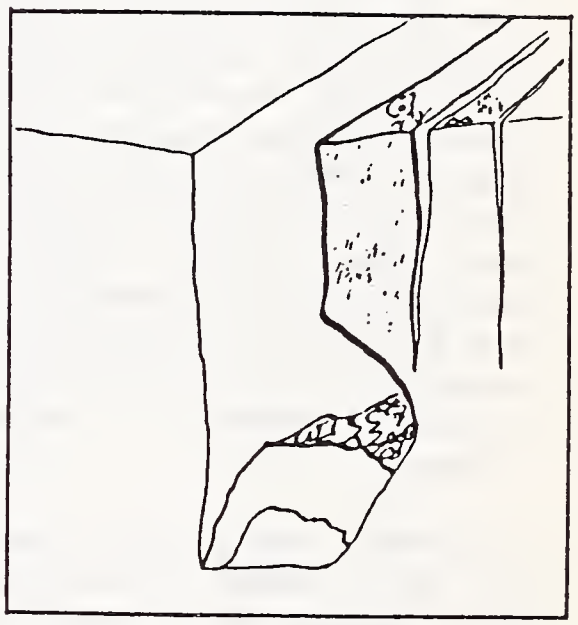


Figure 6

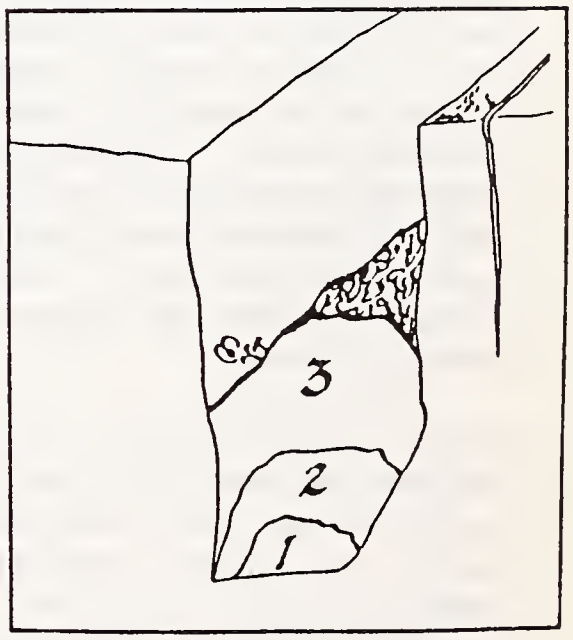


Figure 7

(see figure 6). For the same reasons, a third cave-in is not far behind (see figure 7). Soil, like concrete, is normally quite strong in compression, but not at all strong in tension. Reinforced concrete takes advantage of the compressive strength of concrete and the tensile strength of steel. Unfortunately, there is no steel in the soil. There are those who contend that tree roots will serve that purpose. They are wishful thinkers.

The second failure, from the upper part of the trench, will occur very soon after the first failure at the bottom. Often, a worker will be trapped by a first cave-in, and fellow workers will jump into the trench to help. The second and third cave-ins are generally the ones that kill or maim the would-be rescuers. There is at least one case where the second and third cave-ins caught and killed separate groups of rescuers.

Cave-ins generally occur in multiples (see figure 8). If the first one doesn't get you, the second one may. If not, the third one is always a possibility. Remember, soil weighs at least 3,000 pounds, or one and one-half tons per cubic yard. Even a small cave-in weighs as much as a piece of construction equipment; the human body was never meant to catch a truck.

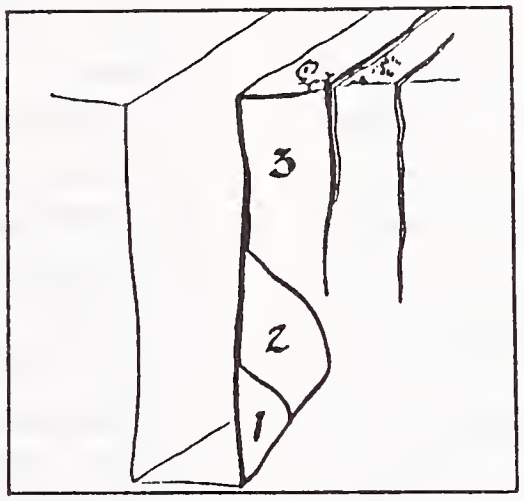


Figure 8

Jack L. Mickle, Ph.D., is a professor of civil engineering (geo-technical) in the civil and construction engineering department at Iowa State University, Ames, Iowa. He has been involved in trenching and excavation safety for 22 years.

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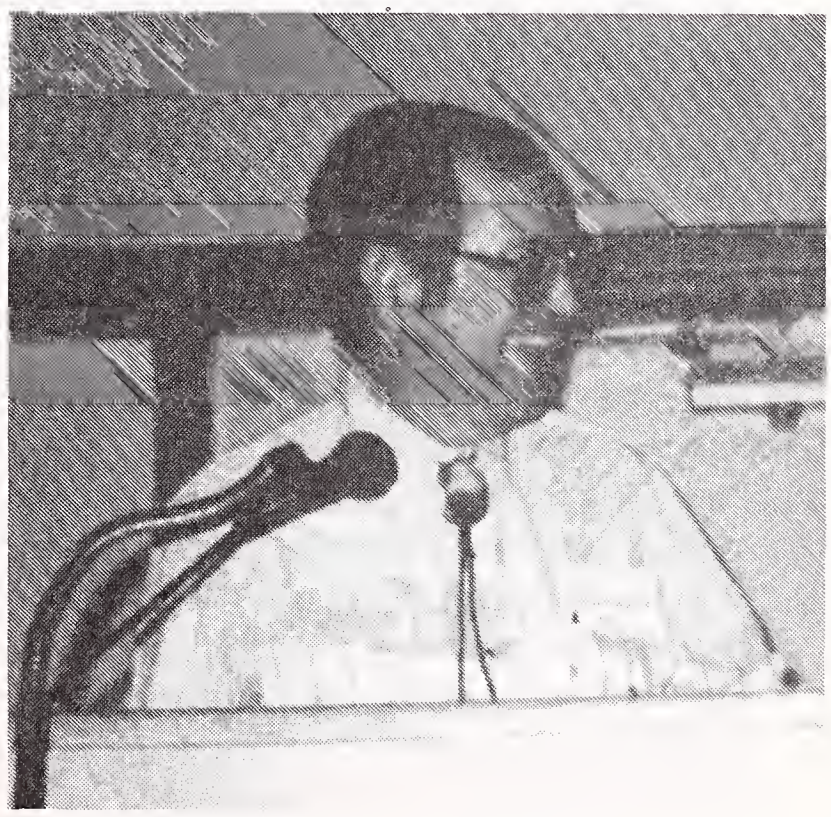
SCENES FROM LAST YEAR'S CONFERENCE

Conference Attendees



Dick Montgomery...enjoying giving gifts

* *Aquatic Viruses Unexpectedly Abundant* *

Using a high-speed centrifuge and a sensitive electron microscope, scientists have discovered that even pristine marine and freshwater environments harbor astonishing numbers of aquatic viruses.

The newly discovered viral concentrations exceed by up to 10 million times those previously recorded in aquatic environments, suggesting these minuscule microbes - some as small as 60 nanometers - represent a much bigger piece of the ecological puzzle than scientists believed. Moreover, although the viruses themselves appear incapable of infecting humans, they may create a health threat by injecting disease-causing genes into common bacteria.

Gunnar Bratbak and his colleagues at the University of Bergen in Norway subjected filtered water samples to 100,000 times the force of gravity and analyzed the resulting sediment. Among other findings, they determined that 1 teaspoon of North Atlantic seawater taken from 10 meters below the surface contained 75 million individual viruses. More than 1 billion viruses appeared in a teaspoon of water from a nutrient-rich lake, they report in the August 10 NATURE.

"This is very exciting and important work," says biologist Mary E. Silver of the University of California, Santa Cruz. "With so many [viruses] there, it raises the question of what they are all doing."

Most seem busy infecting aquatic bacteria, possibly accounting for the immense and unexplained bacterial turnover rates in water, Bratbak says. Every minute, grazing protozoans gobble huge numbers of aquatic bacteria, yet studies indicate bacterial reproduction far exceeds these grazing rates. The new findings suggest that viruses, which can multiply in bacterial cells before killing them, may account for a third or more of aquatic bacterial mortality.

The implications of this covert infection frenzy are many, says Evelyn B. Sherr of the University of Georgia Marine Institute on Sapolo Island. For ecologists, it suggests that a surprisingly vast majority of the energy exchange in the aquatic food web occurs among organisms small enough to pass right through the sieves of the smallest filter-feeding animals. This could radically alter current models of aquatic nutrient cycles, which have focused on larger plankton as the food chain's first significant link (SN: 7/30/88, p.68).

Sherr adds that high rates of virus-induced bacterial rupture might account for much of the free DNA found in seawater - scraps previously attributed to "sloppy feeding" by protozoan grazers.

Moreover, high viral concentrations might result in unusually high rates of bacterial evolution, since viruses can carry bits of bacterial DNA from one bacterium to another. On a positive note, this could result in the rapid emergence of bacteria capable of digesting toxic wastes after a spill. "On the other hand," Sherr says some bacteria "might develop enzymes that degrade things like boat bottoms."

More worrisome, she says, is the possibility that genes for antibiotic resistance or increased bacterial virulence - common in the raw sewage flushed into waterways - may rapidly spread via viruses to benign bacterial strains.

And Bratbak warns that if laboratory-engineered bacteria make their way into waters teeming with viruses, they may be more likely to pass their altered genes to native bacteria. So far, scientists have looked only on land for such DNA donations and have used the negative findings to justify further releases.

- R. Weiss

EPA
DRINKING WATER ENFORCEMENT

By: Dean Chaussee - Montana EPA

Enforcement -- a word no one wants to hear! Whether it's a traffic ticket for exceeding the speed limit or a citation for not taking the required number of bacteriological samples last month, nobody wants to get caught. However, enforcement is sometimes necessary to protect the health of water consumers, because not everyone is as interested in producing safe drinking water as you are. Just the fact that you're interested enough to read this article indicates you're probably concerned about providing the best water possible to your customers.

National drinking water regulations were, and continue to be, established under the 1974 Federal Safe Drinking Water Act (SDWA). The authority to enforce these regulations was given to the U.S. Environmental Protection Agency (EPA). EPA then passed along some of this responsibility to the State of Montana.

The drinking water program in Montana (plan review, technical assistance, data review, training, enforcement, etc.) is conducted by the Water Quality Bureau (WQB). However, the ultimate authority for ensuring that all public water systems (PWS) in the U.S. meet the Safe Drinking Water Act regulations falls to the EPA.

The WQB has been a bit short on legal resources the past couple of years, and consequently, many PWS violations have not been adequately pursued. In an effort to support the state program, the EPA has begun a series of enforcement actions to bring a number of water systems back into compliance and insure that the customers of those systems are receiving safe water.

Water systems with violations may have a variety of problems. Many of the violations result from the system operator simply not taking the required number of bacteriological samples or the bacti samples showing some signs of contamination. The solutions to these problems are generally inexpensive and quickly found. Other PWS, however, may be faced with problems that are much more difficult and expensive to solve. High levels of turbidity from a surface source, or high levels of other contaminants like nitrates, fluorides, or organic materials may require additional treatment or even developing a new source of supply. No doubt these solutions may take several years and lots of federal, state, or local dollars, so local

consumers will see their water bills go up. That's why the EPA enforcement process requires that all water customers are informed about problems their water system is having. They also have an opportunity to give their opinion on what the solution might be. This is called the "public notification process."

The EPA enforcement process involves several steps

1. The WQB is notified that a federal enforcement action is being planned. This is done through a **NOTICE OF VIOLATION** (NOV) in which the violations are outlined in letters to both the WQB and the public water supply involved.

2. EPA issues a proposed **ADMINISTRATIVE ORDER** (AO) which includes a public notice explaining the process and offering the opportunity for a public hearing.

3. The AO is then issued to the PWS spelling out the requirements necessary for them to regain compliance such as sampling, engineering study, chlorination, treatment, etc. The AO also sets a schedule for when compliance is to be achieved.

4. If the PWS refuses to comply with the AO or misses one of the deadlines in the schedule, EPA may then apply an administrative penalty of up to $5000. EPA can also go one more step and seek civil penalties of up to $25,000 per day per violation.

Hopefully, it will never be necessary in Montana to go through all of these steps to achieve compliance, but the procedures are all there and ready to be applied. The EPA Office has already issued 19 NOV's and is in the process of sending out the Administrative Orders.

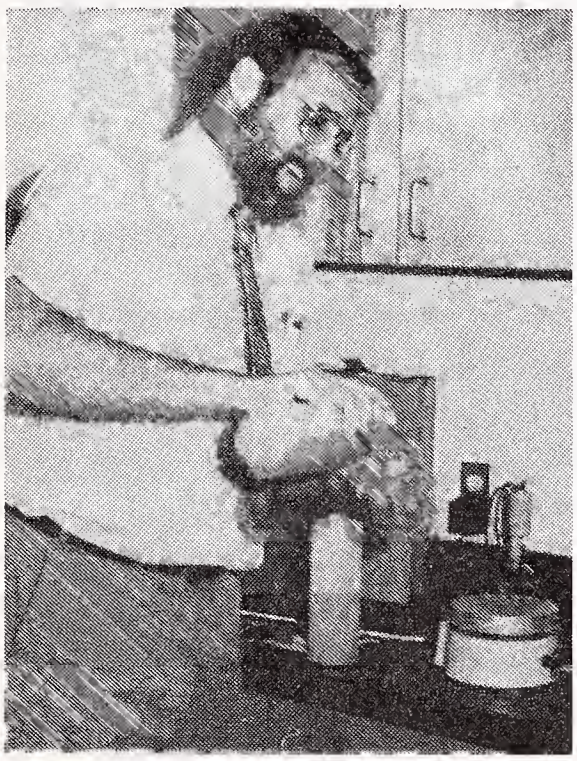
The State has also stepped-up its enforcement activities. The WQB recently announced that more than 100 PWS could be receiving State Administrative Orders. The process of sorting out the violating systems has begun and the orders are expected to be issued in August or September.

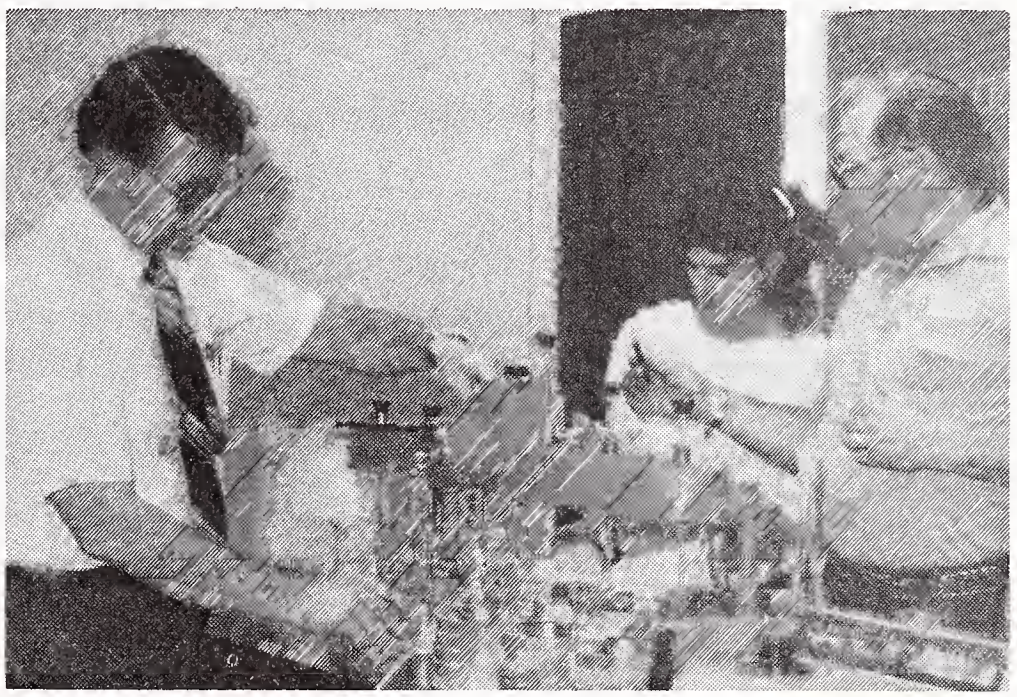
Most water operators are concerned about providing good, safe drinking water to their customers and they do this by following the State and Federal drinking water regulations. The bottom line is to "protect public health." This can only be guaranteed when competent, well-trained operators give their best efforts to produce safe drinking water, and they are backed up by an active enforcement process, carried out by State and Federal agencies.

HAPPENINGS WITH METC

By: Doris Roberts
Northern Montana College

The first six months of 1990 were very productive for all the people involved in the Montana Environmental Training Center (METC). Training organizations have been trying to present a wide variety of topics to environmental professionals. Workshop titles that have been offered include *Surface Water Treatment, Hazardous Chemicals, Pumps, Water Treatment Process Control, Advanced Wastewater Treatment, Collection Systems Operation and Maintenance, Lagoons, Disinfection, Safety, Basic Electricity, etc.* Following are pictures taken at several workshops.





The success of METC can be shared by everyone. The input from people working in the environmental field is what drives the type and number of workshops presented. Remember, if you have an idea for a workshop, tell us! And, let us know if you have heard a presenter at a workshop that you would like to hear again. Equipment to aid in the presentation of workshops is still being purchased. Manuals on various topics are being developed. A Mac computer and scanner have been purchased to aid in the layout and printing of handouts and manuals.

The Lending Library is being expanded. Jan Boyle, METC Coordinator, is now in the process of cataloging all the books and materials in the library. Once they have been cataloged, a new booklet of what is available will be printed and available upon request and at workshops. Have you seen any materials you think would be valuable to have in the library? Let Jan know. Her phone number is 761-0417, or you could write her at METC, 1211 NW Bypass, Great Falls, Montana 59404.

Just in case you didn't receive a calendar or misplaced the one you had, here is a table outlining the workshops that will be presented from July through December, 1990. Hope to see you at one of them.

UPCOMING WORKSHOPS	LOCATION	DATE	SPONSOR
TROUBLE SHOOTING LAGOONS	KALISPELL	08-28	METC
CROSS CONNECTIONS	PLENTYWOOD	09-11	MRWS
CROSS CONNECTIONS	HAVRE	09-13	MRWS
OPERATOR SCHOOL	BOZEMAN	09-24 thru 27	WQB MSU
WORKSHOP FOR WATER AND WASTEWATER ADMINISTRATORS	BILLINGS	10-11	METC
CROSS CONNECTIONS	BUTTE	10-16	MRWS
CROSS CONNECTIONS	MISSOULA	10-18	MRWS
LABORATORY TECHNIQUES	HAVRE	10-23,24	METC
GROUNDWATER CONTAMINATION & WELL CONSTRUCTION	MISSOULA	10-25	METC
GROUNDWATER CONTAMINATION & WELL CONSTRUCTION	LEWISTOWN	11-8	METC
DISINFECTION	KALISPELL	11-20	METC
DISINFECTION	GREAT FALLS	11-27	METC
WATER SYSTEM OPERATION	MISSOULA	12-4	METC

ENERGY CONSERVATION AND WASTEWATER TREATMENT TIPS and THIS & THAT

By: Rodney W. Portch
NATAS Technical Specialist

On a national basis, approximately 20 to 30 percent of municipal wastewater treatment budgets are allocated for purchased energy. The balance of the costs are for treatment chemicals, labor, administration and equipment (both maintenance and replacement). The collection and treatment of sewage is an essential service in this country that is often taken for granted. In an era of constant budget constraints, energy conservation can play a significant role in cutting costs.

Managers of wastewater treatment facilities can start with the basics by taking the following steps that won't alter the operation of their facilities.

TURN OFF THE LIGHTS! Barstow, California's city government was not energy-conscious until the cost of energy started to rise dramatically in the late 1970's and early 1980's. All decorative and off-hour lighting that was not needed for security purposes was eliminated. The essential lighting was changed from mercury-vapor to high-pressure sodium. All nonessential heating and air-conditioning units were turned off at the end of each work day. Excess lighting and unneeded fixtures were removed (no temptation to turn them on if they aren't there!).

WATCH YOUR PUMPS! Pumps should be sized properly, and the smallest available units used to reduce energy costs.

TRY TO SCHEDULE YOUR BIG ENERGY USERS TO OFF-PEAK HOURS! A waste treatment plant in Woonsocket, Rhode Island saved more than eight percent of its annual electrical bill of $440,000 by scheduling the use and testing of auxiliary equipment to off-peak hours during weekends and second shifts.

More Potential Energy-Savers

WATCH THOSE DEMAND CHARGES! Most of the energy used in an "average" plant is electrical energy, driving the motors, mixers, and pumps in the system. The demand charges for this electricity can comprise up to 25 percent of the total electrical bill for the treatment facility. To lower these charges, according to researchers, operate only the essential equipment simultaneously, using the least expensive power source. Nonessential equipment should be operated off-peak on a schedule that will stagger operations and minimize demand.

These measures are all non-intrusive to the plant design and operation. The cost to implement changes on this first level of conservation is usually only the time needed to educate plant operators and staff to use energy sense. They can truly make "cents" with little or no effort.

Identifying Energy Conservation Measures

Energy conservation can translate directly into cost savings. The savings will benefit not only the wastewater treatment programs, but also the community at large in the form of lower taxes and service fees. The greatest impacts on energy consumption can be obtained with an organized approach to conservation, involving all aspects of the treatment process and all the players -- both operations and management.

Energy conservation measures can be defined as those modifications to wastewater plant operations or equipment that will reduce either the amount of energy consumed or the basic cost of the energy. According to researchers at the University of Florida, identifying energy conservation measures can be as simple as:

1. Understanding and becoming familiar with the power company billing procedures.

2. Reviewing the historical energy consumption of the plant as a whole.

3. Developing a list of major energy-using equipment and conducting performance tests for equipment efficiency and power draw.

4. Identifying current process control procedures.

5. Analyzing the collected data to identify those areas that could impact energy consumption or costs.

Usually, this mini-audit of the waste treatment process will identify major energy users and indicate where the largest potential impacts for savings exist.

Mutsakis and Rader, in an article from WATER/Engineering & Management (November 1986), said making use of innovations such as static mixers can lower energy costs and reduce the demand for process control chemicals. Traditionally, mixing tasks have been handled with dynamic agitators. Static mixers do not consume power like rotating equipment, since they fit in-line and have no moving parts. Before replacing any dynamic agitators, check out the viability of using static mixers. According to the authors, these mixers rapidly and uniformly distribute the chemicals for waste treatment, right in the pipe.

Larger motors with high service factors (power demands) and variable flow rates may benefit from the installation of electronic speed controls. These controls may be particularly applicable in sludge-handling operations. Theoretically, if a pump can be operated at half speed, it will consume one-eighth the electrical energy.

Making the most of your resources could mean using the sludge to produce biogas in a digester system for sludge treatment. Properly managed and controlled, this process could be a net energy-saver. The biogas produced in the system could be used to generate all or a portion of the thermal and electrical energy needed to operate the system.

A Look to the Future

The future may bring radical changes to the wastewater treatment industry. John H. Todd of the New Alchemy Institute has a space-age treatment facility up and running in Providence, Rhode Island. A solar-powered aquatic greenhouse uses a series of tanks to process 20,000 gallons of raw sewage into clean water each day. The tanks in the system are home to more than 200 species of plants and two dozen species of fish along with a host of microorganisms. This "space-age approach" is the one Mother Nature has been using all along, turning waste into resources for other living organisms.

While still in the development stage, this greenhouse treatment project could serve as an example for treatment systems throughout the country and the world. Properly managed, the effluent of clean water from the "space-age" plant versus the chemical-laden outfall from some current treatment plants would undoubtedly benefit the earth.

NATAS

Since 1984, the National Appropriate Technology Assistance Service (NATAS) has helped more than 50,000 individuals, small businesses, state and federal government representatives, nonprofits, and other groups and organizations to implement a wide variety of energy conservation and renewable energy projects, including energy conservation projects for wastewater treatment plants. The purpose of NATAS is to promote and encourage the use of energy conservation and renewable energy to help consumers reduce their utility bills and at the same time to help the country reduce it's dependence on finite fossil fuels.

NATAS maintains an ongoing commitment to help requesters in all phases of energy conservation and renewable energy projects. A person can contact NATAS several times during a project, if necessary, to ask additional questions. In each case, they will receive individual attention from a NATAS technical or business assistance specialist. For help with any energy conservation or renewable energy project, write to: NATAS, P.O. Box 2525, Butte, Montana 59702; or call toll-free: (800) 428-2525, or in Montana (800) 428-1718.

NEWS...ABOUT CERTIFICATION

By: Rosemary Fossum
Water Quality Bureau Certification Officer

THE SECOND TRAINING BIENNIUM FOR CONTINUING EDUCATION CREDITS ENDED JUNE 30, 1990:

We estimate that 10,200 training hours were earned by nearly 1,000 Montana fully certified Class 1-4 operators during that biennium. Over 150 courses were approved for continuing education credit. METC, MRW, MSU, NMC, and MAWWA-MWPCF are familiar acronyms to all but a few Montana operators as names of training providers offering well-publicized quality training on a regular basis.

As we start a new training biennium, we have a chance to learn something new - recall something forgotten - understand something previously missed, improve something which needed improving, sharpen up skills grown sloppy, interact with or teach other operators, share our ideas for needed training, or plan some professional growth. We also have a chance to forget required training until the last two weeks of the biennium, shun nearby course opportunities, or repeat the same CPR course you took last time just to satisfy the requirement. To do the latter is a waste and a blow to integrity - yours and ours. The truth is that properly operating a water or wastewater system is of significant importance to the protection of public health and safety and to the environment. Your professional attitude about the seriousness of being an operator is meant to be stimulated by continuing education. Integrity has to do with the preservation or "conservation" of the truth. We need to keep a sense of integrity about CEC's. Fortunately, most operators maintain an enthusiastic interest and participation in continuing education. They're what have made the four-year-old continuing education program the great success story it is.

HERE ARE A FEW THINGS TO REMEMBER ABOUT CEC'S FOR NEXT TIME:

The CEC regulation copy is available from the certification office.

The training biennium began July 1, 1990 and will end June 30, 1992.

The CEC requirements DOUBLE beginning July 1, 1992 to June 30, 1994.

Your address must be current with us in order to receive fourth-class mail such as the training calendar, training notices, and CLEARWATER.

ABC'S RECIPROCITY REGISTRY:

The Association of Boards of Certification (ABC) offers examinations in Water Distribution, Water Treatment, Wastewater Treatment, and Wastewater Collection in four classes with Class 4 as the top. Those passing these examinations will receive a Reciprocity Registry Certificate which is renewable every three years by renewal fee of $25 plus three continuing education credits. To take an ABC exam, an application and non-refundable fee of $25 must be sent to ABC. Upon determination that the minimum qualifications for the exam selected have been met, ABC will notify the applicant of his or her acceptance and will set a testing date. There is a $25 examination fee to take an ABC examination. Montana has agreed to proctor ABC exams at our examination points and has ABC application kits available from the certification office. Qualifications to take an ABC exam include a minimum number of years of education and experience together with current state certification. The application kits have instructions, rules for education and experience substitutions, and worksheets for classifying your plant/system. For further information, contact the certification office at 444-2691 or ABC, P. O. Box 786, Ames, Iowa 50010-0786.

57TH ANNUAL SCHOOL

WATER AND WASTEWATER OPERATORS AND MANAGERS

DATES: September 24 through 27, 1990
PLACE: Strand Union Building, Montana State University
REGISTRATION: 8:00 to 9:30 a.m. on September 24 **(NO PREREGISTRATION)**
CEC's: up to 2.5

We are pleased to announce the Fifty-Seventh Annual Operators School to be held September 24 through September 27, 1990 at Montana State University in Bozeman, Montana. This year's school will include a wide variety of topics presented by experts in the field. In addition to the general sessions, sessions for operator study (SOS) have been scheduled. The SOS will offer individual instruction in solving math and hydraulic problems encountered in the day-to-day operation of water and wastewater systems. All of the sessions will be of great help to those planning to take the Operator's Exam on Friday, September 28, or at other scheduled times throughout the year.

The operator certification exam is administered separately from the Operator's School. You do not have to take the exam if you attend the Operator's School, nor do you have to attend the Operator's School in order to take the exam. However, you should find the exam much easier after four days of participation at the school. If you wish to take the exam, you must contact **Rosemary Fossum, DHES, Water Quality Bureau, Cogswell Building, Helena, Montana 59620 406-444-2691**

As a reminder, attendance at the Operator's School will satisfy the continuing education credits required by June 30, 1992 for all operators.

This year's registration fee is $50. Checks and purchase orders should be made payable to Montana State University and brought to the school. There is no preregistration. This year's school will be held in the Strand Union Building (SUB). Each person will have to make his/her own arrangements for lodging and meals.

We are expecting an informative, useful and exciting school this year. Hope to see you there!

For further information contact:

Dick Peterson or Dave Aune
Water Quality Bureau
Department of Health and
Environmental Sciences
Cogswell Building, Room A-206
Helena, Montana 59620 406-444-2406

Howard Peavy
Department of Civil and
Agricultural Engineering
412 Cobleigh Hall
Montana State University
Bozeman, Montana 59717 406-994-6690

57TH ANNUAL SCHOOL

WATER AND WASTEWATER OPERATORS AND MANAGERS

MONDAY, September 24, 1990

JOINT SESSION	8:00	Registration
	9:30	Welcome (MSU & DHES) School Logistics
	9:45	Operator Certification
	10:15	How to Communicate with Elected Officials or Budget and Financial Planning or Setting up an Education Program
	11:00	Waterborne Disease
WASTEWATER	1:00	Lift Stations
	1:45	Reading and Applying Pump Curves
	2:15	Wastewater Treatment Processes
	3:00	Break
WATER	1:00	Regulations Affecting Public Water Supplies
	2:00	Plan Review and Approval Process
	2:30	Reading and Applying Pump Curves
JOINT	3:15	Disinfection or Backflow/Cross Connections
	4:30	SOS
	5:00	Happy Hour (MSAWWA & MWPCA)

TUESDAY, September 25, 1990

WASTEWATER	8:00	Biological Process Control
WATER	8:00	Basics of Filtration Processes and Chemical Addition
	10:00	Break
	10:30	Polymers and Alum Alternatives
	11:00	Chemical Feed Calculations
	11:45	Lunch
	1:00	Taste and Odor Control
	2:00	Safe Handling of Water Treatment Chemicals
	3:00	Break

SMALLSYSTEMS	8:00	Groundwater Contamination and Cleanup Technologies
	9:30	Well Construction
	10:00	Break
	10:30	Well Operation and Maintenance
	11:45	Lunch
	1:00	Water Storage Tanks
	2:30	Record Keeping
	3:00	Break
JOINT SESSION	3:15	Safety
	4:15	SOS

WEDNESDAY, September 26, 1990

WASTEWATER	8:00	Sludge Accountability
	9:30	Use of Microscope
	10:00	Break
	10:30	Use of Microscope (Continued)
	11:45	Lunch
	1:00	Compliance Inspection, Self-Monitoring
	1:45	BOD
	2:30	Solids Handling
	3:00	Break
WATER	8:00	Corrosion and Corrosion Control
	9:00	Energy Conservation - Pumps, etc.
	10:00	Break
	10:30	Controls for Public Water Systems
	11:45	Lunch
	1:00	Basic Math/Hydraulics
	2:00	Distribution System Maintenance - Pigging
	3:00	Break
SMALLSYSTEMS	8:00	Lagoon Operation and Maintenance
	10:00	Break
	10:30	Polson's Preventive Maintenance Program
	11:10	Use of DO and pH meters
	11:45	Lunch
	1:00	Use of Pesticides and Herbicides
	2:00	Permit and Self-Monitoring
	2:30	Seasonal Discharge Workshop
	3:00	Break
JOINT	3:15	Backflow/Cross Connections or Disinfection

THURSDAY, September 27, 1990

JOINT	8:00	Pumps (Chesterfield)
	10:00	Break
	10:30	Basic Electricity
	11:30	Wrap-up
	12:00	Adjourn
	1:00	SOS

EXAMINATION NOTICE

ON FRIDAY----------SEPTEMBER 28, 1990----------8:30 A.M. TO 12:30 P.M.

Examinations for certification as a Water Distribution System Operator, Water Plant Operator, and Wastewater Plant Operator will be administered in BALLROOM C of the STRAND STUDENT UNION, MSU, BOZEMAN.

The examinations will be given at the conclusion of the annual Water School jointly sponsored by the Water Quality Bureau and Montana State University and held on the MSU campus September 24-27. Attendance at the school is not required in order to take a certification examination. However, anyone planning to take an examination must complete a certification application AND examination registration slip before September 14, 1990. For further information, please contact:

Rosemary Fossum
Water/Wastewater Operator Certification
Water Quality Bureau - Room A206 - Cogswell Building
Helena, Montana 59620 (Phone: 444-2691)

Annual fees for fiscal year 90/91 payable with the application are: Class 1 - $27; Class 2 - $22; Class 3 - $17; Class 4 - $12; Class 5 - $10. Make checks payable to DHES, OPERATOR CERTIFICATION. No preregistration is required for Water School. **Fees for the school are payable to MSU at the time of registration on September 24.**

Those who have previously submitted certification applications and fees for fiscal year 90/91 will need only to submit EXAMINATION REGISTRATION SLIPS (detachable below) with a fee of $5 per examination. PLEASE RETAIN THE UPPER PORTION OF THIS NOTICE.

EXAMINATION REGISTRATION SLIP
(Fill out and mail by 9/14/90 with $5 per exam
to DHES, Mgmt. Services, Helena, 59620)

On September 28, 1990, I will take the examination(s) I have checked below:

Type	Class:	1	2	3	4	5
Water Distribution	(A)	___	___	___	___	___
Water Plant or Well	(B)	___	___	___	___	
Wastewater Plant	(C)	___	___	___	___	

*Note: Combination examinations are offered for 2A3B, 3A4B, 4AB, and 5AB and require $5 examination fee only.

NAME:_____ **SYSTEM:**_____

ADDRESS:_____

MSAWWA CHAIRMAN'S CORNER VIEWPOINT
AWWA - An Informational Resource

By: Terence W. Richmond, Chairman

Summer is here and most communities in Montana, with perhaps the exception of our friends in the northeast, have been fortunate to have received above or near average winter and spring precipitation. We are presently in good shape from a water quantity standpoint. The long, warm dog days of summer will begin to test the resources of each individual community's water system. Most Montana communities will be able to cope with the increasing demand for water through the summer months, with little more than rationing through odd/even day sprinkling restrictions. This annual summer demand that is placed on Montana systems is anticipated and for the most part is effectively managed without significant hardship for consumers.

Unfortunately, there are many more sinister malefactors lying within our cool Montana waters that will soon place demands on unprepared community water systems. These will hit us in the face like a cold winter blast from the Alberta Express. On June 29, 1989, the U.S. EPA formally published in the Federal Register final regulations for surface water treatment. These regulations cover filtration, disinfection, turbidity, Giardia Lamblia, viruses, Legionella, and heterotrophic bacteria and apply to all public community and non-community water systems that use surface water sources or groundwater sources that are under direct influence of surface water. The basis of this rule is the belief that all surface waters and groundwater under the direct influence of surface water are at risk, at least to some degree, from contamination by Giardia Lamblia and other protozoa, viruses and pathogenic bacteria. Public water systems using these source waters must provide minimum levels of treatment to ensure protection from illnesses caused by the contaminants. Maximum containment level goals are established for the following:

Giardia Lamblia	0
Viruses	0
Legionella	0

Treatment Requirements

1. All public water systems using any surface water or groundwater under direct influence of surface water are required to disinfect and may be required to install filtration, unless certain water quality source requirements and site-specific requirements are met.

2. Treatment technique requirements are established in place of maximum contaminant levels (MCLs) for Giardia, viruses, HPC bacteria, Legionella and turbidity. Treatment (disinfection with or without filtration) must achieve at least 99.9 percent removal and/or inactivation of Giardia Lamblia cysts and 99.99 percent removal and/or inactivation of viruses.

3. Operating criteria are established for systems that currently have filtration or that must install filtration because of this rule. Filtered water turbidity must at no time exceed five (5) NTU and must meet the following turbidity limits in 95 percent of the measurements taken:

Filtration System Used	Turbidity Limit
-Conventional treatment or direct filtration	0.5 NTU
-Slow sand filtration	1 NTU
-Diatomaceous earth	1 NTU
-Other technologies approved by the State	1 NTU

Measurements must be made every four (4) hours by grab sampling or continuous monitoring.

4. The residual disinfectant in treated water entering the distribution system cannot be less than 0.2 mg/L for more than four (4) hours.

5. The residual disinfectant (measured as total chlorine, combined chlorine, or chlorine dioxide) in treated water in the distribution system cannot be undetectable in more than five (5) percent of the samples taken in a month, for any two (2) consecutive months. A system may measure for heterotrophic plate count (HPC) in lieu of disinfectant residual. If the HPC measurement is less than 500 colonies/mL, the site is considered to have "detectable" residual for compliance purposes.

On January 22, 1990, AWWAreleased a Notice of Final Regulatory Action on the regulations for surface water treatment. The AWWA notice contains material to inform you of the major provisions of the rule and to guide you to information sources that will help you evaluate the impact of the rule requirements on your system.

Your community/utility should begin now (or sooner) to determine how the requirements of this rule will impact current operations. I urge you to review the impacts of this regulation with your Administrative Board or Council and begin planning now by establishing a capital improvement program, adjusting water use rates, preparing feasibility studies, updating existing water system plans, etc., to be able to be in compliance. The major impact of the surface water regulations will be after 1992, but the effective date for unfiltered surface source systems is December 30, 1991 for monitoring and reporting, among other requirements.

Surface water treatment regulation is only one of the summer spoilers (challenges) the water industry will be facing in the decade of the 90's. Lead, radionuclides, fluoridation, pesticides, well head protection, etc., and many other challenges including State primacy will have significant impact. AWWA is in an excellent position to help you meet the challenges of the 90's. Membership recently exceeded 50,000 members; 1989 was a record year for activities, new publications, exhibits and income; and discussion is ongoing for full-time AWWA section staffing. Small systems continue to be a major focus, through establishment of a clearinghouse, video training and a Big Brother support program in many sections.

I urge you before the heat of the summer gets too hot to handle to get involved in AWWA,by becoming a member or being more active if you are a member. Committee assignments are now finalized for 1990-1991 and will be distributed with the Clearwater. If you are interested in becoming a member of AWWA,or if you are in need of assistance with a problem in your community, please feel free to contact any of the MSAWWA Board of Directors...they would be most happy to hear from you.

MSAWWA/MWPCA

OFFICERS AND COMMITTEES

AWWA and WPCF committees are composed of volunteers from all aspects of water and wastewater professions. Committee work keeps our organizations functioning and is directly responsible for the many benefits of Montana's section activities.

If you would like to serve on a committee, or make recommendations to their members, here they are!

MWPCA BOARD OF DIRECTORS/EXECUTIVE COMMITTEE

National Director - Kristi Kline, City of Havre

President - Barry Damschen, Damschen and Associates, Helena

President Elect - Howard Peavy, Montana State University

Vice President - Scott Anderson, Water Quality Bureau

Senior Trustee - Craig Brawner, City of Bozeman

Junior Trustee - Fred Wendt, Silver Bow Metro

Executive Secretary - Dick Pedersen, Water Quality Bureau

PWOD Director - Tim Hunter, City of Missoula

MSAWWA BOARD OF DIRECTORS/EXECUTIVE COMMITTEE

National Director - Ralph Dunahoo, City of Conrad (1990) - Dick Nisbet, City of Helena (1991/1993)

Past Chairman - Gerald Lukasik, Mountain Water Company, Missoula

Chairman - Terry Richmond, Morrison-Maierle/CSSA, Kalispell

Chairman Elect - Dan Fraser, Water Quality Bureau

Vice Chairman - James Kaercher, HKM Associates, Billings

Senior Trustee - Steve Ruhd, City of Conrad

Junior Trustee - Chip Johnson, Stensatter, Druyvestein & Associates, Missoula

Secretary-Treasurer - Donna Jensen, Water Quality Bureau

MSAWWA/MWPCA JOINT COMMITTEES (1990-1991)

Safety & Heroism - Dick Pedersen, Craig Brawner, Terry Richmond

Resolutions - Mark Richardson, Tim Berry

Host City Committee - Gerald Lukasik, Tim Hunter, David Haverfield, Starr Sullivan, Kris Kok, Jim Carlson, Chip Johnson, Tom Hanson

Publications & Technical Papers - Donna Jensen, Dick Pedersen, Dan Fraser, Michele Marsh

Program - Mike Patterson, Donna Jensen, Henry Elbrecht, Craig Brawner, Tom Wing, Dan Fraser, Dave Haverfield, W.R. McGee, Ben VanDyke, Paul Torok

Sections Directory - Ralph Dunahoo, Scott Anderson, Donna Jensen, Ray Armstrong, Joe Steiner

Historical - Tim Berry, L. Woodward, Ralph Dunahoo, Dick Nisbet

Scholarship - Joe Steiner, Kristi Kline, Dan Fraser, Terry Richmond, Henry Elbrecht

Government Affairs - Jim Melstad, Lyle Meeks, Scott Anderson, Bill Leonard, Dean Chaussee, Steve Ruhd

Manufacturer Representatives - Mike Richards, Jerry Eastmark, Rob Balderson

Public Information - Kristi Kline, Michele Marsh, Tim Miller

Education - Dick Pedersen, Barry Damschen, Kristi Kline, Howard Peavy, Bill Leonard, James Kaercher, Denise Ingman

Auditing - Howard Peavy, James Kaercher

AWWA FULLER AWARD COMMITTEE

Mike Thomas, Richard A. Nisbet, Dan Fraser, Tim Berry, Robert G. Millons, Mike Patterson

MSAWWA SMALL SYSTEMS COMMITTEE

Dave Haverfield, Dan Fraser, James Kaercher, Judy Sass, Tom Wing, Ralph Dunahoo, Gary Zuroff

MSAWWA MEMBERSHIP COMMITTEE

Mike Patterson, Ralph Dunahoo, Dick Nisbet, Gerald Lukasik, Terry Richmond, Dan Fraser, James Kaercher, Steve Ruhd, Donna Jensen

MSAWWA HONORS & AWARDS COMMITTEE

Terry Richmond, Paul Torok

MSAWWA CONSTITUTION AND BY-LAWS

Ralph Dunahoo, Dick Nisbet, Gerald Lukasik

MWPCA HONORS & AWARDS COMMITTEE

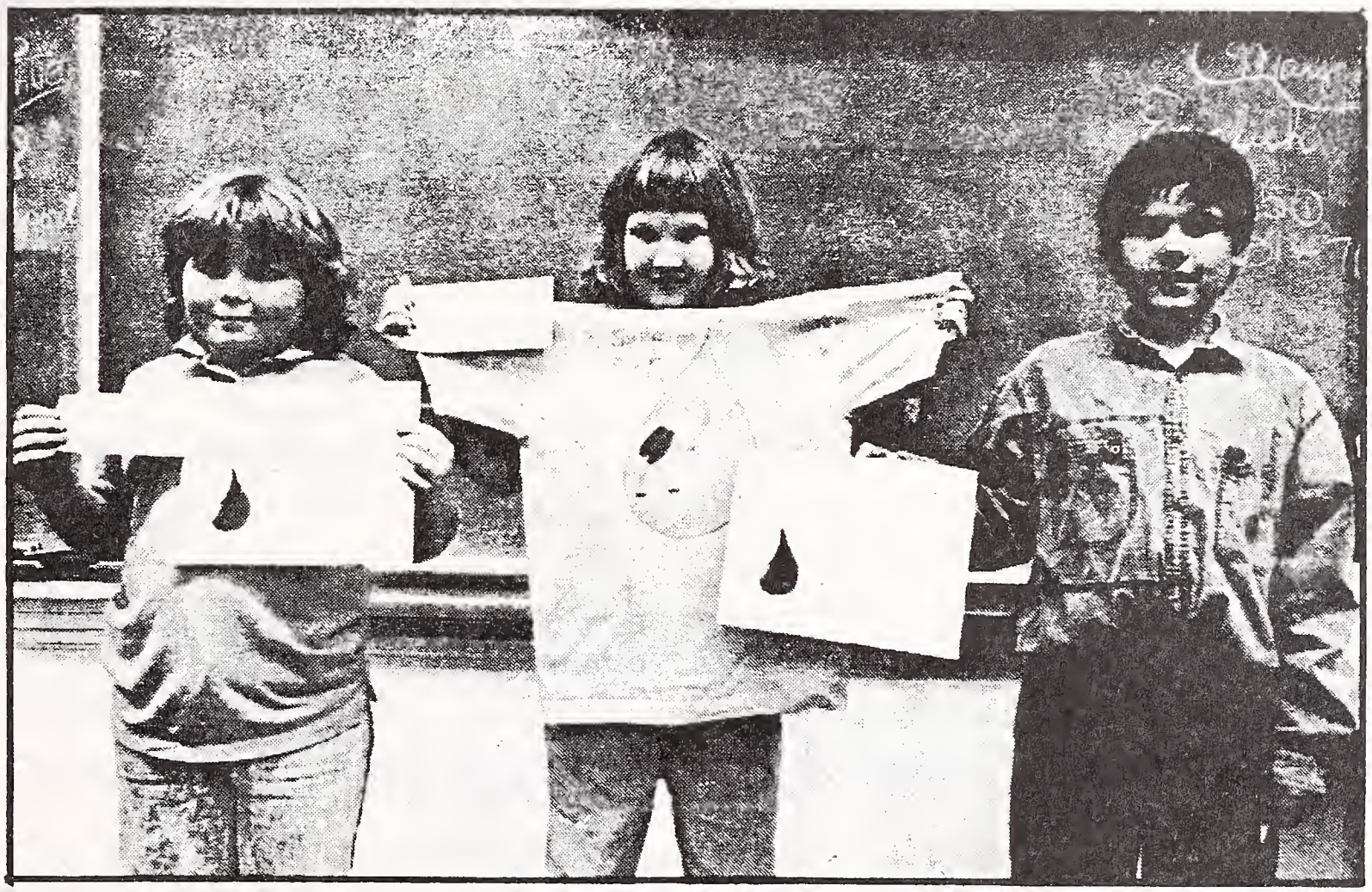
Barry Damschen, Kristi Kline, Joe Steiner, Dick Pedersen

MWPCA MEMBERSHIP

Scott Anderson, Kristi Kline, Tim Hunter, Barry Damschen, Howard Peavy, Craig Brawner, Fred Wendt, Dick Pedersen

*LUCY BROWN ** RUBY BLAND ** ROBERT MARTIN*

Havre Daily News, Havre, Montana, Tuesday Evening, May 8, 1990—3



Drinking water winners

The Havre Daily News/TODD GOODRICH

National Drinking Water Week is May 6-12 and this year's T-shirt design winners are, from left, theme winner Lucy Brown, overall winner Ruby Bland and originality winner Robert Martin. Brown and Martin each receive a $10 certificate, and Bland wins a $50 savings bond and her design is put on T-shirts.

To celebrate and help promote National Drinking Water Week May 6-12, 1990, the Montana AWWA and WPCA sections sponsored a statewide **"Design A T-Shirt"** contest. The contest was open to Grades 3-6. Simple logo designs were sent in by students depicting their ideas on the importance of drinking water and its future. The following three category winners were chosen:

1. Overall Logo design - Designed by Ruby Bland - 3rd grade, Devlin School - Havre. She won a $50 saving bond, a certificate of honor and her design silk-screened on our shirt.

2. Originality design - Design by Robert Martin - 3rd grade, Highland Park School - Havre. He won $10 and a certificate of honor.

3. Theme design - Designed by Lucy Brown - 3rd grade, Devlin School - Havre. She won $10 and a certificate of honor.

All three of these participants were VERY EXCITED to have won and just couldn't believe it! All participants were given certificates of honor and their designs were displayed for the public to see during National Drinking Water Week. This was a statewide competition but we only received entries from the schools in Havre. We hope next year every facility will help to promote this and get more entries in!

The winning designed T-Shirt will be on display during the Water School in Bozeman in September and during the annual Montana AWWA/WPCA convention held in Missoula in May 1991. The winning T-shirt can be ordered by contacting Kristi Kline at 265-9031 or Shelley Nolan at 265-4800.

Join Now and Grow With Us

INDIVIDUAL

AMERICAN WATER WORKS ASSOCIATION MEMBERSHIP APPLICATION

Complete this form and mail to:
AWWA / 6666 W. Quincy Avenue / Denver, CO 80235 / (303) 794-7711

BSCWS

AWWA USE ONLY

PLEASE PRINT OR TYPE

LAST NAME _____ FIRST NAME (and middle initial) _____

MAILING ADDRESS _____

CITY _____ STATE OR PROVINCE _____ ZIP CODE _____

AREA CODE _____ TELEPHONE _____

TITLE _____

EMPLOYER'S NAME (if not already in mailing address) _____

APPLICANT'S SIGNATURE _____ DATE _____

SIGNATURE OF AWWA MEMBER ENDORSING APPLICATION (Optional) _____ ENDORSER MEMBER NUMBER _____

ANNUAL DUES $_____

NEG Assessment* _____

Multi-Section Option (other than own) _____

Total Due $_____

Check One		Grade Code	Annual Dues
☐	Active	02	$58.00
☐	Affiliate (Strictly for operator-level personnel or employees of small utilities)	06	27.00
☐	Student (Must be enrolled and carrying at least 10 credit hours)	14	20.00

*Applicants with an address in the New England Section (ME, NH, RI, VT, MA) are required to include an assessment of $26.50 with their AWWA dues.
Multi-section membership on reverse side.

Make check payable to AWWA (Canadian funds add 15%)

☐ American Express ☐ Diner's Club ☐ MasterCard ☐ Visa

Credit Card No. _____

Exp. Date _____

☐ Send invoice

If you have been a member of AWWA before, indicate dates here:

_____

ALL APPLICANTS SHOULD COMPLETE THIS SECTION:

Circle the descriptions below that best describe you. The information is used in audits of AWWA readership.
Circle only ONE in each group.

1. BUSINESS AND INDUSTRY
A. Public Water Supply Utility – Municipally Owned
B. Public Water Supply Utility – Investor Owned
C. Governmental – Federal, State, Local
D. Consultant
E. Contractor
F. Private Industrial Systems or Water Wholesaler
G. Manufacturer of Equipment & Supplies Including Representatives
H. Distributors of Equipment & Supplies Including Representatives
I. Educational Institutions, Faculty and Students, Libraries, and Other Related Organizations
J. Fully Retired
K. Research Labs

2. JOB TITLE
A. Executive – Gen'l Mgr., Commissioner, Board Member, City Mgr., Mayor, President, Vice-President, Owner, Partner, Director, etc.
B. Management – Division Head, Section Head, Mgr., Chief Engineer, Comptroller, etc.
C. Engineering/non-managerial – Civil Engr., Mech. Engr., Envir. Engr., Planning Mgr., Field Engr., Systems Designer, etc.
D. Scientific/non-managerial – Chemist, Biologist, Biophysicist, Researcher, Analyst, etc.
E. Purchasing – Purchasing Agent, Procurement Specialist, Buyer, etc.
F. Operations – Foreman, Operator, Maintenance, Crewman, Service Rep., etc.
G. Marketing & Sales/non-managerial – Mkt. Analyst, Mkt. Rep., Salesman, Sales Rep., etc.
H. Other (describe) _____

_____

CHECK FIELD(S) SERVED:
5 ☐ Water Supply Only
7 ☐ Wastewater Only
9 ☐ Both
3 ☐ Other

In some AWWA sections, a portion of the section allotment equal to 50 percent or more of the domestic subscription rate charged for the section periodical will be allocated toward a subscription of that periodical.

Dues allocated for each publication members receive:
Journal $25
Mainstream $6
OpFlow $5
Waterworld News $5

Membership Application

Water Pollution Control Federation
601 Wythe Street
Alexandria, Virginia 22314-1994

Association
Montana Water Pollution Control Association

Use this application to join the Water Pollution Control Federation and your local Member Association. Simply complete this application and return it to the address below. Along with your monthly publications, you are also entitled to group insurance, technical assistance, discount on technical publications, and much more!

Please print.

First Name, Middle Initial (11) | Last Name (16) | (Jr., Sr., etc.) (3)

Mailing address ☐ Business or ☐ Home

Business Name (if applicable) (30)

Street or P.O. Box (30)

City (20) | State (2) | Zip Code (9)

Area Code—Telephone (10) | Country (If Outside U.S.) (16)

WPCF Sponsor (Not Required) | Sponsor's Member I.D. Number (6)

(28)

Employer Code (2)

11 - Local/Regional Government/Agency
13 - State/Interstate Government/Agency
16 - Federal Government/Agency
21 - Consulting Firm (Engineering/Other)
25 - Wastewater Equipment/Material/Supplier
27 - Industry
28 - Construction Contractor
31 - Educational Institution
61 - Other (Please specify): _____

Education Code (1)

1 - Less than High School
2 - Training Courses, Short School
3 - High School
4 - Attended College
5 - Completed Junior College
6 - Bachelor's Degree
7 - Advanced Degree

Membership Categories

☐ **Active**	☐ **Operations Division**	☐ **Student**	☐ **Corporate**
For individuals involved or interested in the advancement of knowledge pertaining to water quality.	For individuals working on a day-to-day basis (or retired from) in a wastewater collection, treatment, or laboratory facility.	For individuals enrolled at least half-time in a college or university.	For companies engaged in the design, construction, operation or management of water quality systems.
Dues $ 55.00	Dues $ 22.50	Dues $ 19.50	Dues $ 180.00
Journal Included	*Journal* ☐ $30.00	*Journal* Included	*Journal* Included
Highlights Included	*Highlights* ☐ $15.00	*Highlights* Included	*Highlights* Included
Forum ☐ $12.50	*Forum* Included	*Forum* ☐ $12.50	*Forum* Included
TOTAL $ _____	TOTAL $ _____	TOTAL $ _____	TOTAL $ _____

Method of Payment

☐ Check Enclosed—Make check payable to WPCF.
☐ Charge my ☐ VISA ☐ MasterCard ☐ _____

Account Number | Exp. Date

( )
Signature | Daytime Phone No.

Send Completed Application and Payment to:

WPCF, Member Records
601 Wythe Street
Alexandria, Virginia 22314-1994

For more information, call (703) 684-2452

Postal Requirement: Dues allocated for publications when included in membership: *JWPCF* — $15; *Highlights* — $3; *Operations Forum* — $5.

DEADLINES FOR BIG SKY CLEARWATER ARTICLES

The Big Sky Clearwater is a biannual publication for water and wastewater operators. The Clearwater is distributed to certified operators, Montana Section members of AWWA and WPCA, and other interested parties. Over 1600 copies were mailed for each issue last year.

Editors of the Clearwater are always interested in receiving articles of interest to the water and wastewater industry. If you have any ideas, information or handy tips you would like to pass on to others involved in the water and wastewater field, please contact the Water Quality Bureau about publication of your article in the Clearwater.

Articles can be brief, or a few pages in length. They may consist of your own thoughts and ideas, your experiences, day-to-day operational tips, or technical subjects. Photos and diagrams are also welcome. ***Articles to be published in the Big Sky Clearwater must be submitted for consideration prior to January 1 and July 1.***

Submit articles to: *Editor, Big Sky Clearwater*
MDHES Water Quality Bureau
Cogswell Building - Room A206
Helena, MT 59620

Water Quality Bureau
Department of Health and
Environmental Sciences
Room A-206, Cogswell Building
Helena, Montana 59620

TO:

1,700 copies of this public document were published at an estimated cost of $1.15 per copy, for a total cost of $1,950.00 which includes $1,950.00 for printing and $.00 for distribution.